The Internet & Television Association
25 Massachusetts Avenue, NW | Suite 100
Washington, DC 20001
(202) 222-2300

Steve Morris
Vice President &
Deputy General Counsel
o (202) 222-2454 e smorris@ncta.com

July 22, 2019

VIA ECFS

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
455 12th Street SW
Washington, DC 20554

Re: Broadband Deployment Advisory Committee, GN Docket No. 17-83
Wireline Infrastructure, WC Docket No. 17-84
Wireless Infrastructure, WT Docket No. 17-79

Dear Ms. Dortch,

NCTA – The Internet & Television Association (NCTA) hereby submits the attached report from Dr. Michelle Connolly entitled "The Economic Impact of Section 224 Exemption of Municipal and Cooperative Poles." In the paper, Dr. Connolly, a former FCC Chief Economist, demonstrates that the monopoly pole attachment rates charged by municipal and cooperative electric companies are more than double the rates charged by investor-owned utilities. She further finds that this significant disparity in rates "cannot be explained by differences in economic costs" and instead is attributable to the fact that rates charged by municipal and cooperative electric companies are not subject to regulation pursuant to Section 224 of the Communications Act.

Dr. Connolly's paper also responds to a recent paper submitted by the National Rural Electric Cooperative Association (NRECA) in the above-referenced proceedings.[1] NRECA suggests that there is no need for the Commission to be concerned about excessive pole attachment rates charged by municipal and cooperative electric companies because there are other, more significant, obstacles to broadband deployment in rural areas. But as Dr. Connolly explains, "any fact which negatively impacts expected profits in one geographic area will, at the margin, lead to an increased likelihood that investments will be made elsewhere." Moreover, she explains that it is not just the certainty of currently excessive pole attachment rates that deters deployment, but also the prospect of unregulated increases in those rates once broadband facilities have been deployed. These concerns are exacerbated in cases where the municipal or

[1] *See* RURAL ELECTRIC COOPERATIVES: POLE ATTACHMENT POLICIES AND ISSUES (June 2019), attached to Letter from Jim Matheson, CEO, NRECA, to Ajit Pai, Chairman, Federal Communications Commission, GN Docket No. 17-83 (June 10, 2019).

cooperative electric is an actual or potential competitor in the broadband market because it can use its leverage over pole attachment rates to penalize its competitors.

NCTA appreciates the ongoing efforts of the Commission and the Broadband Deployment Advisory Committee to promote broadband deployment and we encourage them to incorporate Dr. Connolly's analysis into any future decisions.

Respectfully submitted,

/s/ Steven F. Morris

Steven F. Morris

Attachment

The Economic Impact of Section 224 Exemption of Municipal and Cooperative Poles[*]

MICHELLE CONNOLLY, PH.D.

July 12, 2019

[*]This report has been underwritten by NCTA. The opinions and viewpoints expressed are those of the author alone. I thank Chin Jie Lim and Catherine McNish for excellent research assistance. I remain responsible for any errors.

TABLE OF CONTENTS

I. Introduction and Summary Findings

Section 224 of the Communications Act directs the Federal Communications Commission (FCC) to regulate, using a cost-based approach, annual rental rates for attachments to poles owned or controlled by investor-owned (IO) electric utilities and phone companies unless a State certifies to the FCC that it does so directly. As more fully explained later, the majority of these "certified states" follow the FCC approach in regulating IO pole attachments. However, the FCC's pole attachment regulations (and most certified state law equivalents) currently do not apply to pole attachment rates charged by Municipal (Muni) and electric Cooperative (Coop) pole owners that serve 28% of the U.S. population. Monopoly status for local pole ownership, combined with this exemption, has allowed Muni and Coop owners to charge pole attachment rates that far exceed the regulated rates charged by IO utilities.

I have been asked by the NCTA – The Internet & Television Association ("NCTA"), the principal trade association for the U.S. cable industry, to estimate the prevalence and magnitude of the differences of Muni and Coop pole attachment rates relative to IO rates. In doing so, I analyzed 2017 data from cable operators for over 52.2 million pole attachment rental rates in 50 states and the District of Columbia. These data reveal that, on average, Coops and Munis charge pole attachment rates that are more than double the rates charged by IO utilities. Nationally, the average annual pole attachment rate charged for access to poles of IO utilities is **$6.84** per pole, while the average rate charged by Coops and Munis is **$15.39** and **$14.86**, respectively. While these measures are specific to rates paid by the cable operators in this survey, it is worth emphasizing that additional costs from excessive pole attachment rates are borne by all communication service providers –wireline and wireless – that attach to Coop and Muni owned poles.

Extreme disparities between average IO rates and Coop and Muni rates – as well as the extreme range of rates charged by Coops and Munis within their own ownership type – *cannot* be explained by differences in economic costs. The costs associated with the pole itself are rather straightforward and consistent across pole ownership types. To the extent that total pole costs vary, such variation is primarily the result of differences in geography (rurality and topography). Any consequent variations in pole attachment costs are incorporated into the FCC cable rate formula. The FCC approach sets each pole owner's annual rates based on that owner's own cost data from the prior year. Hence, cost variation across pole owners is not in of itself a valid argument against consistent and uniform rate regulation across ownership types.

Given the excessive pole attachment rates charged by Coops and Munis, congressional removal of the Coop and Muni exemption from FCC jurisdiction in Section 224 of the Communications Act would help to ensure that pole owners, regardless of ownership type, charge rates that are consistent with the FCC cost-based rates. Because local regulations require that firms attaching to poles use existing utility facilities rather than install their own, removal of the Section 224 exemption for Coops and Munis is needed to prevent them from charging monopoly level pole attachment rates. Moreover, making these pole owners subject to the general Section 224 framework would create greater consistency in expectations over future pole attachment rates, reduce uncertainty and help increase overall investment in all communications networks that must rely on pole attachments. Such changes can be expected to offer particular benefits to rural areas where on average more poles must be passed to reach each consumer, and to competitive fairness as Coops and Munis would be prevented from using excessive rates which skew investments by broadband providers away from the areas in which the Coops and Munis are located.

II. Overview of Section 224

Utility poles generally are owned by electric and telephone utilities. Due to local zoning, environmental and cost restrictions, broadband and competitive telecommunications providers are prohibited from erecting duplicate poles and, therefore, must rely on agreements with pole owners to attach to existing poles. Given that pole owners have monopoly power over facilities that are essential to broadband deployment, they have incentives to over-allocate costs to firms that need to attach to their poles.

Repeated cases of abuse of monopoly power in the setting of pole attachment rates led to the passage of the Pole Attachment Act (now codified as Section 224 of the Communications Act) in 1978.[1] Specifically, Section 224 gives the FCC authority to "…regulate the rates, terms, and conditions of pole attachments to provide that such rates, terms, and conditions are just and reasonable" in states that do not themselves regulate these rates, terms and conditions.[2] Section 224 instructs the FCC to adopt rules that ensure pole attachment rates compensate the pole owner based on costs related to an attachment.[3]

The incremental costs of accommodating an attachment are collected by the pole owner through "make-ready" charges – i.e., charges associated with making the pole ready for an attachment. These include moving existing facilities on the pole to make room for the new

[1] S. Rep. No. 580, 95th Cong., 1st Sess. 13 (1977).
[2] See 47 U.S.C. § 224 (c) "a State shall not be considered to regulate the rates, terms and conditions for pole attachments (A) unless the State has issued and made effective rules and regulations implement the State's regulatory authority over pole attachments; and (B) with respect to any individual matter, unless the State takes final action on a complaint" within 180 days, or as prescribed by rule, up to 360 days.
[3] 47 U.S.C. § 224(b)(1) (instructing the FCC to promulgate rules that ensure that rates are just and reasonable) and (d)(1)(stating that a rate is just and reasonable if it is "not less than the additional costs of providing pole attachment, nor more than an amount determined by multiplying the percentage of the total usable space or the percentage of the total duct or conduit capacity, which is occupied by the pole attachment by the sum of the operating expenses and actual capital costs of the utility attributable to the entire pole, duct, conduit, or right-of-way").

attachment, guying a pole, or even replacing a pole. The attaching entity pays 100% of these make-ready costs.

The annual rental rate, which attaching entities pay on top of directly reimbursed "make-ready charges," allows the pole owner to charge the attaching entity for a share of the costs associated with the surplus pole space occupied by the attachment. Again, this is in addition to full payment by the attaching entity for the incremental cost of accommodating the attachment.[4] The FCC cable formula determines the maximum pole attachment rate based on the percent of usable space on a pole occupied by an attachment,[5] the net cost of a bare pole (which excludes depreciation, accumulated deferred taxes, and cross arms, etc. used by the utility but not by attaching communications entities), and the carrying charge rate:

$$Maximum\ Rate\ = \frac{Space\ Occupied}{Total\ Usabl\ \ Space} \times Cost\ of\ a\ Bare\ Pole\ \times\ Carrying\ Charge\ Rate.$$[6]

[4] The State of NC Utilities Commission explained that, "As with interruptible electric service, the evidence here reflects that Union Power and the other Cooperatives do not incur capital investment to provide TWC with pole attachment service. Instead, TWC is entitled to make pole attachments only to the extent that pole space is available and not required for the Cooperatives' own facilities. TWC's service rights are even more limited than those of an interruptible service customer because TWC itself absorbs any necessary capital expenditures in connection with making space on the Cooperatives' poles, yet continues to pay for the service thereby made possible." State of NC Utilities Commission, *Order Resolving Pole Attachment Complaint Pursuant to G.S. 62-350*, Doc No. EC-39, Sub 44 at 47 (2017).

[5] Today, the majority of poles available for attachment are 35, 40 or 45 feet tall. The FCC uses a rebuttable estimate of 37.5 ft. for the average attachable pole based on pole heights in existence in the 1980s, when the formula was adopted. Usable space for wireline attachments is based on the rebuttable average pole height of 37.5 minus 24 ft. of "unusable space" (6ft. for burying, 18 ft. for ground clearance), or 13.5 ft. Each attachment is presumed to occupy 1 ft., based on standard separations required between communications attachments. In disputed cases, Munis and Coops have been found to estimate larger attachment rates because they have assumed greater than the FCC allowed space allocation measures. For example, in 2017 the NC Utilities Commission agreed that based on the FCC rate formula, Union Power should have charged pole attachment rates of $7.29 in 2015 and $7.86 in $2016. Union Power, a Coop, had been charging $15 (State of NC Utilities Commission Doc No. EC-39, Sub 44).

[6] FCC 00-116 at 14 (2000). The FCC formula uses each pole owner's publicly reported state cost data to derive the net pole investment and annual carrying costs associated with the poles. After passage of the Telecommunications Act of 1996, which amended Section 224 to include rate protections for telecommunications carriers, the FCC developed an additional rate formula to comply with the Act's new cost allocation, resulting in two formulas producing different rates. The FCC later modified that formula so that today, both the original "cable formula" and

The carrying charge rate "reflects those costs incurred by the utility in owning and maintaining poles regardless of the presence of pole attachments."[7] The elements determining the appropriate carrying charge rate include administrative costs, maintenance, depreciation, taxes and a rate of return.[8] The FCC formula has been upheld by the Supreme Court as *fully compensatory*.[9] The large majority of certified states have adopted the FCC cable formula, or a close variation, for setting IO pole attachment rates.

When the Pole Attachment Act was enacted over forty years ago, Congress reported that Coops and Munis charged the lowest pole attachment rates and that it anticipated that Coops and Munis would continue to charge low rates because of "…an added incentive to foster the growth of cable television in their areas."[10] Congress therefore chose to exclude Munis and Coops from the FCC's jurisdiction and corresponding obligations of certified states. Today, both Coops and Munis continue to be exempt.[11]

States may regulate the rates of Coops and Muni pole owners independently of Section 224. To date, 22 states have imposed some type of rate regulation on either Coop or Muni pole attachment rates (or both). However, in the remaining 28 states, Coops or Munis remain fully exempt from any type of pole attachment rate regulation. Even in states with state rate regulation,

---

the "telecom formula" produce very similar rates. The modified telecom formula has also been upheld in court. See *Ameren Corp. v. Fed. Commc'ns Comm'n,* 865 F.3d 1009 (8th Cir. 2017).

[7] FCC 00-116 at 44 (2000).

[8] Notably, Munis and Coops don't typically incur taxes nor do they earn a rate of return. When calculating their rates, therefore, other factors such as payments in lieu of taxes and cost of debt may be used instead.

[9] *FCC v. Florida Power Corp.*, 480 U.S. 245, 253-54 (1987) found that it could not be "seriously argued, that a rate providing for the recovery of fully allocated cost, including the cost of capital, is confiscatory."

[10] S. Rep. No. 580, 95th Cong., 1st Sess. 18 (1977).

[11] Pole rents established under the FCC formula account for each individual utility's pole related investment and expenses and other individual utility characteristics that might affect pole costs. Hence, the attachment rates established by the FCC formula are tailored to each utility's actual pole carrying charges and rise in the case of higher costs. Hence, potential differences in cost are not sufficient justification for Section 224 exemption.

the type of regulation imposed, as well as its enforcement, varies greatly. As shown in the analysis that follows, the presence of state rate regulations imposes some restraint on Coop and Muni rates, but does not achieve the same outcome as full FCC rate regulation. The lack of any rate regulation for Coops and Munis in 28 states, combined with only partially effective state rate regulation in 22 states, has allowed pole attachment rates charged by Coops and Munis to be, on average, more than double that of IO utilities. Moreover, as technology has evolved, many Coops and Munis now directly compete, or have the ability to compete, with companies needing pole attachment agreements to provide broadband services, providing Coops and Munis with an additional incentive to charge higher rates.[12]

III. Total Pole Costs

Before examining pole attachment rates charged in the U.S., it is helpful to consider the costs associated with the pole itself upon which rates are based. These costs are fairly straight forward and, most importantly to this analysis, have no reason to vary based solely on ownership type.

Pole costs include (1) the cost of the bare pole itself along with associated capital costs (i.e., depreciation, taxes, and cost of debt); (2) installation costs; and (3) maintenance and administrative costs (i.e., inspection and upkeep, tree trimming, storm preparedness and recovery associated with the pole itself (and not the electrical facilities themselves), and back office work associated with the pole).

[12] According to NRECA, more than 100 of its 900 electric Cooperatives currently provide broadband service and "…more than 200 Cooperatives are exploring the option and conducting feasibility studies to do so." *See* NRECA (June 2019), *Rural Electric Cooperatives: Pole Attachment Policies and Issues*, at 2.

Wood Pole

The vast majority of distribution poles used for attachments (so called joint-use poles) are wood poles. Wood poles are sold in five-foot increments and various circumference classes, with class 1 being the widest. Generally, joint use poles are 35 to 45 feet in height and at least class 5, and, at the time of this study, typically cost between $400 and $600 new.[13] Aside from general fluctuations in supply and demand, this cost therefore only varies based on pole material, height and width; it does not vary based on pole owner type.[14] Moreover, if existing facilities on a pole need to be rearranged or if an existing pole needs to be replaced entirely with a taller, stronger pole in order to accommodate a new attachment and the existing facilities need to be transferred to the new pole, the new attaching entity reimburses 100% of these "make-ready" costs.

Installation

The costs associated with installing a pole in the ground (labor and material) may vary depending on where the pole is located. I refer to this herein as geography (rurality and topography). For example, installations in wooded or mountainous areas without roads may have higher costs. Similarly, a solid rock surface or a sandy surface might increase installation costs as these locations might require more costly drilling or more guying per pole to guarantee stability. Higher local labor costs would also impact installation costs. Again, however, if a new pole is

[13] For example, American Timber and Steel currently sells class 5 poles between $292.25 (35 foot pole) and $460.65 (45 foot pole). The most expensive class 1 poles (which it only offers in 40 or 45 foot heights) are priced at $603.45 for the 40 foot pole, and $723.10 for the 45 foot pole. While concrete or steel poles cost more, there is no reason to believe that munis or coops use these materials any more frequently than IOs.

[14] Nothing in the data or filings that I have reviewed indicates that Munis and Coops have taller, stronger poles than IOs. In fact, what evidence I have seen related to this topic is consistent with no systematic difference in poles used by Munis, Coops, and IOs. *See* the State of NC Utilities Commission Doc No. EC-39, Sub 44 at 22 and 45 (2017).

required to accommodate a new attachment, the attaching entity reimburses the pole owner for 100% of the make-ready costs.

Maintenance

Poles, which have useful lives of 40 plus years, have relatively low maintenance costs. Once installed, for example, a pole owner may incur costs for inspection of the poles for rot or deterioration (typically done every five to ten years), for vegetation management, storm restoration and recovery (but these costs are shared with its attached electrical (or telephone) service lines) and for back-office expenses associated with the inspections, maintenance, removal, and accounting expenses related to the pole. If a pole needs to be replaced, the pole owner will face removal costs. Some of these expenses, such as clearing vegetation may be greater in more wooded or more rural settings, but again, are costs also incurred for the lines themselves.

Hence, geography would appear to be the primary factor leading to variation in *total pole costs*. Still, geographically related variation in pole costs *are not unique* to Muni or Coop owned poles. Crucially, IO owned poles are present over a greater range of locations, including similar -- and often identical -- counties as Coops and Munis.[15] Thus, to the extent that there are variations in pole attachment costs, these are not related to ownership type and are incorporated into the FCC rate formula.

As will be discussed later in reference to NRECA's recently released white paper, Munis and Coops frequently argue that rurality is the driving force behind their higher pole attachment rates. However, IO utilities are not only present in equally rural areas, but also are very frequently present in the exact same areas as Munis or Coops. In addition, the general similarities in both

[15] This will be illustrated later using the state of Wyoming which has the second lowest population density in the U.S. and multiple mountain ranges providing a range of topographical settings.

poles and locations between unregulated and regulated pole owners has been documented previously. For example, in 2017 the State of North Carolina Utilities Commission states that in North Carolina:

> The poles owned by IOUs and ILECs are 'largely if not entirely indistinguishable' from the poles owned by the Cooperatives. Kravtin, Tr. Vol. 1, pp. 293, 309. Witnesses Martin and Jacobs testified similarly. Neither Union Power's nor the other Cooperatives' witnesses disputed this fact. Witness Kravtin testified that, due in part to historic joint use pole agreements between ILECS and the Cooperatives, those parties have constructed poles with the same physical characteristics—often interspersed in a pole line—as poles owned by the Cooperatives. Further, these poles are sometimes adjacent to virtually identical poles owned by a federally regulated IOU. Due to joint use agreements, in almost all situations, there is only one set of poles on any particular road.[16]

The North Carolina Utilities Commission continues:

> The poles owned by the Cooperatives are fundamentally the same as the investor- and telephone company-owned poles that TWC also relies on in North Carolina and that are subject to the FCC pole attachment rate formula. In addition, IOUs and cooperatively-organized electric utilities operate the same types of facilities to provide the same services. The only meaningful difference identified by the parties is that, as witness Kravtin testified, the Cooperatives' costs are lower than IOU costs, in particular because the Cooperatives have access to money at a lower cost. [17]

IV. Measured Disparities in Pole Attachment Rates

A. NCTA Data

In order for me to analyze the impact of these regulatory exemptions on pole attachment rates, NCTA requested data from nine cable providers (Altice, Charter, Comcast, Cox, GCI, Mediacom, Sjoberg, and Midco and Vyve) on annual pole attachment rates by utility type in all 50 states and the District of Columbia. Five of the nine (Altice, Charter, Comcast, Mediacom, and Midco) additionally reported the number of poles they attach to at each rate.[18] These last five cable operators are all top ten U.S. cable operators by subscribers and households passed. They are

[16] State of NC Utilities Commission Doc No. EC-39, SUB 44, at 22 referencing Kravtin, Tr. Vol. 1, at 293 and 309.
[17] Ibid at 45.
[18] All analysis in this report is based on pole level data from the 48 states and the District of Columbia, where the total number of poles is known, thus allowing for a weighted analysis of rates.

present in a total of 48 states and the District of Columbia and, at the time the data was collected, passed approximately 119.6 million U.S. households.[19] To date, this is the largest and most systematic gathering of data on pole attachment rates in the U.S.[20]

Before conducting my analysis, I wanted to be confident in the representativeness of the NCTA data set. Section A1 of the appendix gives a general overview of my cleaning methodology, and checks that the data set is consistent with what is observed in the utility market. Moreover, given the large percentage of U.S. households passed by the five operators providing NCTA data, the fact that rate information is provided for over 52 million poles, the fact that the data set includes a good representation across ownership-types, and the fact that the data set is consistent with the known presence of different utility owner types in different states, I am confident that the NCTA data provides a good representation of overall pole attachment rates by ownership type in the U.S.

B. Observed Pole Attachment Rates

For the purposes of this report, I focus on differences between IO poles (regardless of whether owned by a telephone company, an electric power company, or both) and Muni and Coop owned poles. Table 1 shows extreme differences in the average rate charged, maximum rates, and the standard deviations for those rates between regulated and unregulated pole owners in the U.S.

[19] According to the U.S. Bureau of the Census there were 126.2 million US households in 2017.
[20] Christopher Yoo created a data set of 592 agreements for wired and 612 agreements for wireless pole attachments. These data were voluntarily submitted by participants in the FCC's Broadband Deployment Advisory Committee (BDAC). The BDAC data set is therefore illustrative but is limited by its total size and the self-selection involved in the provision of the data. Still, Yoo's findings are generally consistent with the findings in my report. See Christopher Yoo, "Survey of Rates for Pole Attachments and Access to Rights of Way," (April 24, 2018).

Table 1. Summary Statistics for 2017 NCTA Data

Pole Owner Type	Avg. Annual Rate	Median	Min	Max	Std. Dev.	Range
Investor Owned (n=45,834,546)	$ 6.84	$ 6.40	$ 0.19	$ 39.36	$ 4.13	$ 39.17
Muni (n=3,120,379)	$ 14.86	$ 14.18	$ 0.30	$ 65.24	$ 9.01	$ 64.94
Coop (n=3,283,549)	$ 15.39	$ 16.24	$ 0.16	$ 94.50	$ 7.29	$ 94.34
All Combined (n=52,238,474)	$ 7.86	$ 6.60	$ 0.16	$ 94.50	$ 5.53	$ 94.34

These data reveal that the average annual pole attachment rate charged for access to poles of IO utilities is **$6.84** per pole, while the average rate charged by Coops and Munis is **$15.39** and **$14.86**, respectively.[21] Hence, the average attachment rate for Coop or Muni owned poles owned is more than twice that of the average rate for IO poles. The maximum annual rate observed is $94.50 which was charged by a Coop in Minnesota. This is more than 12 times higher than the average pole attachment rate in the U.S. The overall variance in the rates charged is also significantly larger for Coops and Munis (i.e., within the ownership classes) than for IO poles. These extreme differences in rates charged by pole ownership type *cannot* be explained by differences in actual costs.

The standard deviation of a distribution measures the dispersion of the observations relative to its mean. Inherently, it tells us how tightly the observations are clustered about the mean of the distribution.[22] A larger standard deviation in one group relative to another shows that relatively

[21] Yoo (2018) finds that the average regulated (IO and private) wired pole attachment rate is $13.97 (based on 254 observations) and the average unregulated (Coop and Muni) wired attachment rate is $21.86 (based on 228 observations).

[22] For example, in a normal distribution, about 68% of all observations are going to be within one standard deviation from the mean; about 95% of all observations are within two standard deviations from the mean.

more observations in that group are distributed towards the extremes of the distribution. Table 1 shows that the standard deviation of Muni pole attachment rates is 2.18 times that of IO rates and that of Coop rates is 1.7 times that of IO rates. Assuming a normal distribution, these standard deviations suggest that 68.2% of all IO rates fall between $2.71 and $10.97. For Munis, 68.2 % of observations fall between $5.85 and $23.87. For Coops, 68.2% fall between $8.11 and $22.68.

As previously discussed, (aside from general market based fluctuations) the cost of the wood pole and the percentage of space occupied varies only based on pole height and width. Installation and maintenance costs vary with geography, but do not vary systematically based on the type of utility that owns the pole.

Yet, the summary statistics in Table 1 show that relative to IOs, (1) the average rates charged by Coops and Munis are higher, (2) that the maximal rates charged by Coops and Munis are higher, and (3) the dispersion of the rates charged by Coops and Munis are higher.

The fact that IOs are present in equally rural locations as Coops and Munis suggests that (if truly based on attributable costs), the maximal rates for Coops and Munis should not be significantly greater than the maximal rates for IOs. Similarly, the smaller variance of locations for Coops and Munis relative to IOs should imply that Coops and Muni rates should more tightly distributed -- rather than more loosely distributed -- around their own means than IO rates. This demonstrates that the extreme variation in observed Coop and Muni rates *is not attributable* to variation in costs driven by location. Both points will be elaborated upon later in the report, using the state of Wyoming to illustrate.

Table 2 provides state level information on average pole attachment rates by ownership type.[23] The last two columns of Table 2 respectively show the ratio of the average Coop rate and the average Muni rate relative to the average IO rate in that state. Hence, these ratios inherently control for any state specific factors that might influence observed attachment rates within the state independently of pole ownership type. In most states, Coop and Muni rates are greater than IO pole rates. At the extreme, in California the average Coop rate is 7.4 times that of the average IO rate and in Hawaii the average Muni rate is 7.8 times that of the average IO rate. Averaging across states, Coop (Muni) rates are 2.16 (1.84) times that of IO rates.

[23] For some states, there are no data entries for a given ownership type. For example, Nebraska has no entries for IO poles. However, this is consistent with the fact that all of Nebraska's utilities appear to be either public power utilities or Municipal utilities. *See* http://www kansasenergy.org/NE_electricity.htm, retrieved Oct 6, 2018. Maryland has only one Municipal utility, Easton Utilities, serving the southeastern portion of the state. It also provides cable television service and therefore it is not surprising that none of the operators have data on entries for this utility.

Table 2. Average Pole Attachment Rates by State in 2017

State	Investor Owned (IO)	Coop	Muni	Coop/IO	Muni/IO
AL	7.03	19.37	18.80	2.76	2.68
AR	3.55	16.65	7.25	4.69	2.04
AZ*	9.77	15.25	-	1.56	-
CA	6.73	49.70	16.79	7.38	2.49
CO	5.26	12.87	8.65	2.45	1.64
CT	9.43	N/A	10.01	N/A	1.06
DC	7.45	N/A	N/A	N/A	N/A
DE	6.36	17.55	8.17	2.76	1.28
FL	8.32	20.64	16.35	2.48	1.96
GA	6.00	19.12	16.82	3.19	2.80
HI	1.10	5.76	8.60	5.22	7.80
IA	3.41	8.21	9.63	2.41	2.82
ID*	13.60	16.73	-	1.23	-
IL	10.42	13.27	11.28	1.27	1.08
IN	6.05	14.49	10.72	2.39	1.77
KS	7.02	10.35	20.41	1.47	2.91
KY	7.14	8.65	21.13	1.21	2.96
LA	6.93	14.04	9.95	2.03	1.44
MA	8.66	N/A	7.71	N/A	0.89
MD*	6.97	6.70	-	0.96	-
ME	10.54	8.62	5.42	0.82	0.51
MI	3.59	3.81	7.54	1.06	2.10
MN	6.02	13.89	9.06	2.31	1.51
MO	9.57	11.97	6.13	1.25	0.64
MS	7.20	16.46	14.58	2.29	2.03
MT	8.52	14.44	6.11	1.69	0.72
NC	7.07	10.82	6.02	1.53	0.85
ND	4.89	2.89	4.50	0.59	0.92
NE	N/A	8.82	9.87	N/A	N/A
NH	13.22	8.72	5.08	0.66	0.38
NJ	6.39	5.59	10.50	0.87	1.64
NM	6.84	12.85	15.02	1.88	2.19
NV*	8.05	22.27	-	2.77	-
NY	7.92	19.53	6.21	2.46	0.78
OH	6.30	11.67	6.76	1.85	1.07
OK	3.54	14.40	6.72	4.06	1.90
OR	8.39	11.80	11.39	1.41	1.36
PA	12.85	14.19	19.59	1.10	1.53
SC	10.15	15.55	10.57	1.53	1.04
SD	7.67	12.32	3.23	1.61	0.42
TN	5.51	17.76	22.87	3.22	4.15
TX	6.89	12.69	10.54	1.84	1.53
UT*	4.84	-	14.50	-	3.00
VA	7.40	24.11	16.89	3.26	2.28
VT	7.65	8.35	5.53	1.09	0.72
WA	8.79	15.91	21.33	1.81	2.43
WI	6.16	19.93	15.68	3.23	2.55
WV	6.82	7.36	N/A	1.08	N/A
WY	5.97	13.95	7.26	2.34	1.22
Average Across 48 States and DC	**7.29**	**14.00**	**11.19**	**2.16**	**1.84**

N/A: Not Applicable: CT, MA and DC have no Coops, WV and DC have no Munis., and NE has no IO utilities. *AZ has two Munis, ID has three Munis, MD and NV have only one Muni present in each, but the five cable operators included this survey do not attach to any of those Muni owned poles. UT has eight Coops but none of these are served by the cable operators in this survey. **Summary statistics and empirical analysis are based on weighted average pole rates. Pole rates for Alaska and Rhode Island were provided, but without information on the number of poles for which each rate applied. Hence weighted averages for AK and RI cannot be measured and are not included in the table or any of the report's analysis.

C. Estimating the Impact of Ownership and State Rate Regulations

Table 3 presents the ratios of average Coop and Muni rates relative to IO rates in states where Coops or Munis are regulated in some fashion, versus states where they are not regulated at all. We see that Coops and Munis in completely unregulated states are charging higher rates. In states without any Coop (Muni) attachment rate regulation, the average Coop (Muni) rate is 2.5 (2.6) times greater than the average IO rate.

Table 3. Pole Attachment Rates in Presence of State Coop and Muni Rate Regulations[24]

	Investor Owned	Coop	Muni	Coop/ Investor	Muni/ Investor
National	$ 6.84	$ 15.39	$ 14.86	225%	217%
without Coop Rate Reg.	$ 7.02	$ 17.52	$ 16.28	250%	
with Coop Rate Reg.	$ 6.38	$ 12.17	$ 11.59	191%	
without Muni Rate Reg.	$ 6.52	$ 16.55	$ 17.12		263%
with Muni Rate Reg.	$ 7.35	$ 12.84	$ 10.92		148%

Even in the presence of state attachment rate regulation for Coop or Muni owned poles, the pole rates charged by Coops and Munis remain much higher than those charged by IO pole owners. This reflects the fact that some of these regulating states do not follow the FCC formula with respect to Coop and Muni poles, may not fully enforce their own regulations, or that these

[24] Of the 52,238,474 national pole attachment observations, 15,059,569 are in states with some state Coop rate regulation and 10,558,485 are in states with some Muni rate regulations.

state regulations are not sufficient to constrain the ability of Coops and Munis to charge supra competitive rates.[25]

The NCTA data set clearly demonstrates that Coops and Munis are on average charging significantly more than IO operators. To analyze this pattern more deeply, Table 4 presents Ordinary Least Squares (OLS) regression results focusing on the relationship between pole attachment rates and ownership type and regulatory environment.

Table 4. Annual Pole Attachment Rates in 2017 Dollars

(1) Benchmark Investor Owned Pole Rate (Constant)	$8.45* (.0020)
(2) Marginal Increase when a **Cooperative**	$9.55* (.0031)
(3) Marginal Increase when a **Municipality**	$9.25* (.0033)
(4) Marginal Change in Benchmark Pole Rate in Presence of State Coop Regulation	- $1.28* (.0095)
(5) Marginal Change in Benchmark Pole Rate in Presence of State Muni Regulation	$4.56* (.0178)
(6) Marginal Impact of State Coop Reg. on Coop Rates	- $4.25* (.0049)
(7) Marginal Impact of State Muni Reg. on Muni Rates	- $5.76* (.0051)
(8) State Fixed Effects (FL used as benchmark)	See Appendix
# Obs.	52,238,474
Adjusted R^2	0.4993

Ordinary Least Squares. Standard errors in parentheses. *Statistically significant at 1% confidence level.

[25]Massachusetts applies the FCC formula to Munis and IOs and is considered one of the states that enforces its regulations. In the case of Massachusetts, this is reflected in the fact that the average Muni pole attachment rate recorded in this data set is lower than the average IO rate (see Table 2).

The model presented in Table 4 includes dummy variables for pole ownership type, for the presence of state level Coop or Muni regulations (regardless of exact regulation or enforcement), and for the state in which the pole is located. These last set of dummies control for state fixed effects. State fixed effects are factors that are constant across a given state, such as that state's average taxes, average population density, average wages, regulatory culture, and other factors that might influence average pole attachment rates or the likelihood that a state has adopted rate regulations.

The variable Coop (Muni) is equal to one if the given rate is from a Coop (Muni) pole and is equal to zero otherwise. One ownership type dummy must be excluded; thus, in this case I exclude the dummy for IO pole ownership. Hence, the coefficients on the Coop (Muni) dummies estimate the *marginal* change in the average rate charged by Coops (Munis) *relative* to IOs. Dummy variables for the presence of Coop or Muni rate regulation estimate the average impact of state regulations on Coop and Muni rates on the *average* pole rate, regardless of ownership type. Finally, state fixed effects estimate the shift in the average pole attachment rate within a state due to state specific traits.[26]

We see in row (1) that the average *benchmark* pole, in this case an IO owned pole in a state without any state Coop or Muni attachment rate regulations, is $8.45. All else equal, rows (2) and

[26] The coefficients of the individual state effects are reported in the appendix. The dummy variable for one state needs to be excluded, though it is not crucial which one is chosen since results are always relative to the excluded state. Florida is used as the benchmark state in these regressions because it has a good number of total observations, it has a fair number of poles in all three ownership categories, and it does not have any state rate regulations for Coops or Munis. Hence the dummy variable for Florida is omitted from the regressions. This means that the coefficients for each state should be interpreted as being relative to average rates in Florida.

(3) show that Coop and Muni rates are on average $9.55 and $9.25 higher, respectively, than IO rates.[27]

Rows (4) and (5) show that the benchmark IO pole rate is $1.28 lower in states with Coop rate regulations and $4.56 higher in states with Muni rate regulations. Specifically, the average IO pole attachment rate is $7.17 ($8.45 - $1.28) in states with Coop rate regulations and $12.90 ($8.45 + $4.56) in states with Muni rate regulations.

Rows (6) and (7) present estimates on the interaction between ownership dummies and the presence of state rate regulation for that particular type of owner. In other words, rows (6) and (7) respectively show the estimated impact of state Coop rate regulations specifically on Coop rates, and the impact of state Muni rate regulations specifically on Muni rates. State Coop rate regulations lower observed Coop rates by $4.25 on average, while state Muni rate regulations lower observed Muni rates by $5.76 on average.

While the average Coop rate is $9.55 more than the average IO rate, it is only $5.30 ($9.55 – $4.25) more when state Coop attachment rate regulations are present. The average Muni rate is $9.25 more than the average IO rate, but only $3.49 ($9.25 - $5.76) more when state Muni attachment rate regulations are present. In both cases, these state attachment rate regulations lead to statistically significantly lower rates. However, if these state rate regulations were as effective on average as the FCC rate regulation at preventing excessive pole attachment rates by Coops and

[27] To calculate the exact average rates charged by Coops or Munis for a specific state, one would add the IO benchmark rate, the coefficient on the Coop or Muni dummy, the coefficients for the presence of regulation on the IO benchmark and on that owner type if relevant in that state, and the coefficient on that state's dummy. To illustrate consider the benchmark state of Florida which has no state attachment rate regulations. The estimated average Muni rate for Florida is $17.70 [$8.45 (constant) + $9.25 (Muni) + $0.0 (no Coop or Muni reg.) + $0.0 (benchmark state fixed effect)].

Munis, then the presence of state rate regulations would fully negate any positive marginal impact of Coop or Muni ownership on observed rates.[28]

Table 5. Average Pole Attachment Rates by Ownership Type and State Regulatory Environment, Controlling for State Fixed Effects

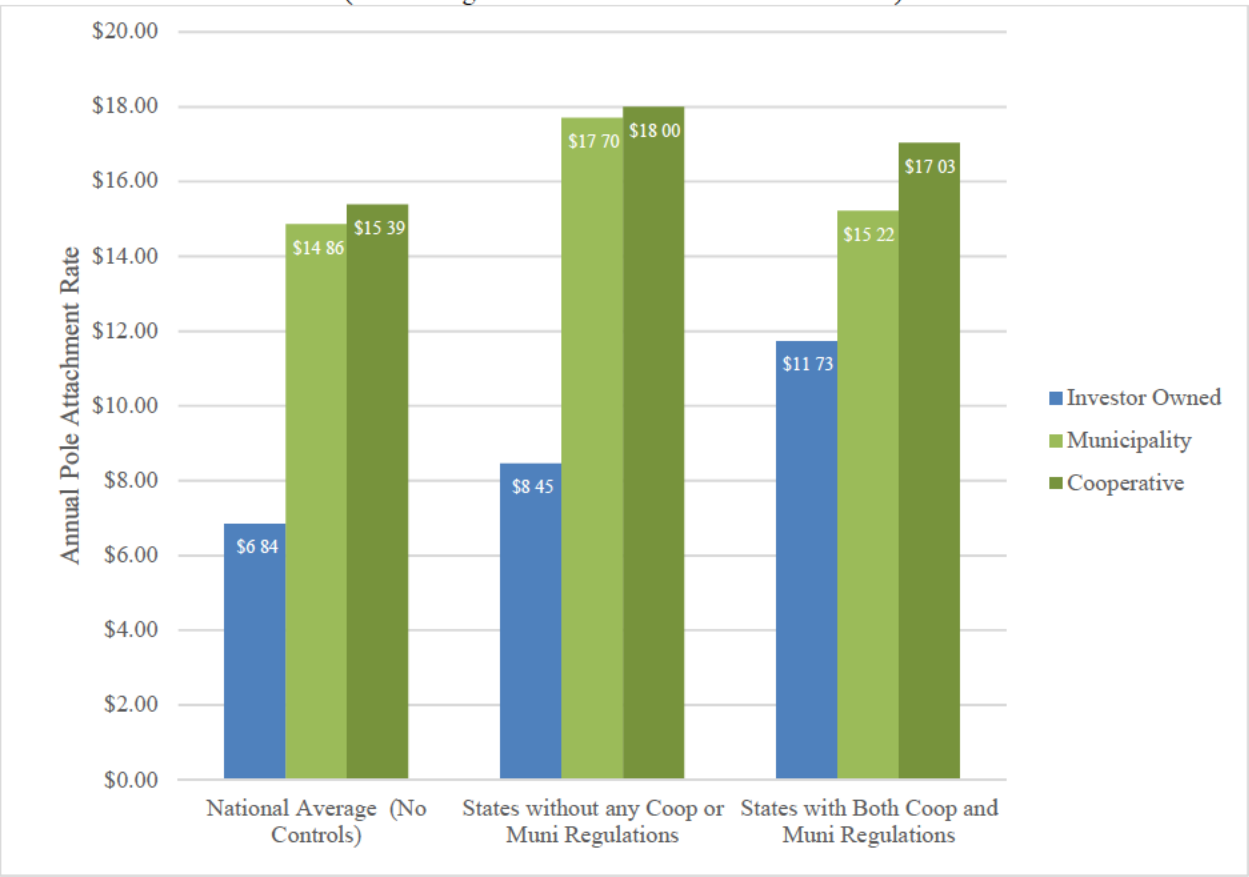
	No Coop or Muni Regulations (1)	Both Coop and Muni Regulations (2)	Only Coop Regulations (3)	Only Muni Regulations (4)
Investor Owned	$8.45	$11.73	$7.17	$13.01
Municipality	$17.70	$15.22	$16.42	$16.50
Cooperative	$18.00	$17.03	$12.47	$22.56

Based on the regression results in Table 4, Table 5 shows the estimated rates by pole ownership type and state regulatory environment, after controlling for state fixed effects.

Figure 1 graphs the estimated pole attachment rates from Table 5 in the case of no state regulations (Column 1) and in the case of both Coop and Muni regulations (Column 2) against the straight national averages when no controls for state location or regulation are included. Coops and Munis are still found to on average be charging more than twice the attachment rate of IO poles. Even in states with Muni and Coop pole attachment rate regulations, Muni and Coop rates are respectively still 130% and 145% that of rates charged by IO utilities in the same state.

[28] In other words, if state rate regulations were effectively replicating what would occur under FCC rate regulation, the coefficient in row (6) (the marginal impact of state Coop rate regulation) should be of the opposite sign but approximately equal in magnitude to the coefficient in row (2) (the marginal impact of Coop ownership). Similarly, the coefficient in row (7) (the marginal impact of state Muni rate regulation) should be of the opposite sign but approximately equal in magnitude to that in row (3) (the marginal impact of Muni ownership).

Figure 1. Average Pole Attachment Rates by Ownership Type
(Controlling for State Fixed Effects in State Results)



The fact that even in the presence of state rate regulations Coops and Munis continue to charge higher rates for pole attachments than IO utilities demonstrates that state rate regulations (as currently defined and enforced) do not on average replicate the rates that would occur if the exemption were removed and muni/coop rates were subject to Section 224 limitations. Expansion of state level attachment rate regulations to all states would therefore not suffice to prevent excessive pole attachment rates on the part of Coops and Munis. Removal of the Coop and Muni exemption from Section 224 is necessary to prevent Coops and Munis from charging supra competitive pole attachment rates.

There is moreover an additional gain to having consistent FCC regulation of maximum Coop and Muni rates across all states, rather than having piecemeal regulations varying from state to state. Greater uniformity of regulations across states would, in the case of pole attachments, reduce total transactions costs and likely decrease the time required for negotiations of pole attachment rates. Both will make it easier for all telecommunications service providers to improve and deploy new services, especially in more rural areas where Coops and Munis are frequently located. Further, uniform application of Section 224 across all pole owners will remove the artificial distortion in broadband investment and deployment choices across markets.

This regression explains just under half of the variation in pole attachment rates observed in this data set. If all rates in this data set were regulated using the FCC rate formula *and* one had access to the cost data for each pole owner, it would be possible to explain a majority of the observed variation in rates. Moreover, in such a case, ownership type would not be statistically significant since variations in all relevant costs would fully determine rates. The fact that ownership type – without evidence of systematic differences in incurred costs by ownership type – is statistically significant (and quite large in magnitude) in this regression highlights that the elevated rates on average charged by Munis and Coops relative to IOs are not based on justifiable cost differences.

One might argue that the statistically significantly higher Muni and Coop rates are due to omitted variable bias. Namely, the estimated coefficients on Coop or Muni ownership could potentially be biased upward *if* poles owned by Coops and Munis are more likely than IO poles to be positively correlated with other variables that positively impact attachment rates *and* those variables are not included in the regression. Again, the inclusion of fixed state effects reduces the

risks of bias in the estimated coefficients given that state fixed effects control for factors common to all poles in a given state that could impact average attachment rates.[29] State fixed effects control for average state population density and topography, but cannot control for more granular differences on population density or topography within a state.

To consider the possible impact of this limitation, I delve more deeply into locational issues for one state. Specifically, I identify, by county, the location of electric service providers in the state of Wyoming.[30]

I consider Wyoming as it has the second lowest population density in the U.S. and has several mountain ranges[31] – two factors that unregulated pole owners claim justify their higher rents. Table 5 lists Wyoming counties from lowest to highest population density, as well as individual electricity service providers which offer service in that county. Figure 2 summarizes this information on a map of Wyoming.

IO utilities are present in five of the six least densely populated counties in Wyoming – counties with less than 2.5 people per square kilometer. Moreover, IO utilities are in the exact same counties as Munis and/or Coops in 18 of the 23 counties. Despite their similarities of locations, the average Muni pole attachment rate is 22% higher and the average Coop rate is 92%

[29] It is important to note that state fixed effects do not control for factors that vary within a state. State fixed effects do however control for factors in a state that might affect all pole costs equally, regardless of ownership type. For example, the fact that one state might *on average* be less densely populated or have lower labor costs than another state is captured by state fixed effects. Again, however, application of the cost-based FCC formula would account for individual utility investments, expenses, or characteristics that might affect pole costs in each location.

[30] Determining all electricity service providers and the footprints of their service areas involves gathering information from many independent sites. While it is not possible to guarantee 100 percent inclusion, this list in Table 5 is quite inclusive and demonstrates the range of locations of all ownership types.

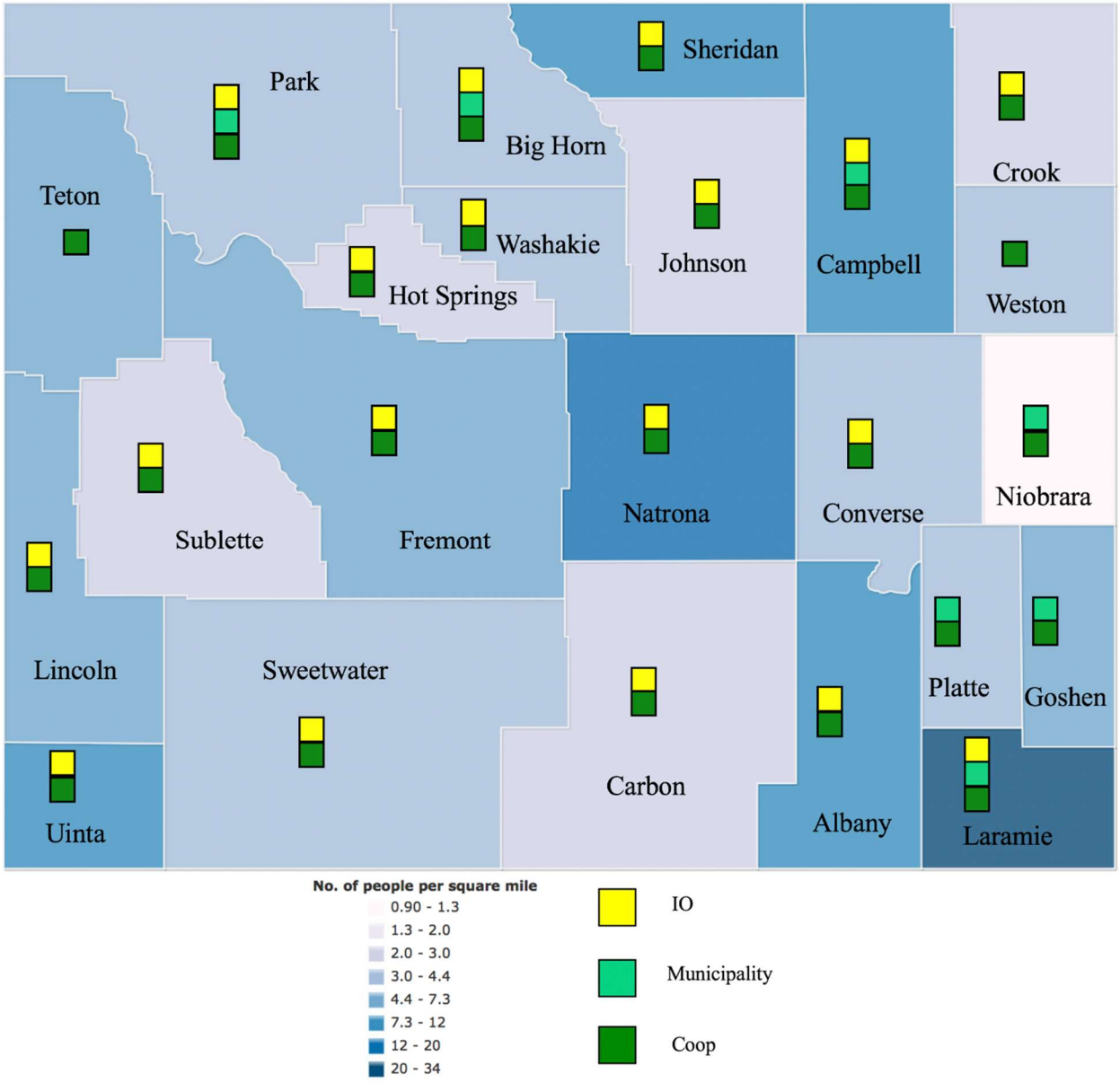
[31] Wyoming has an average population density of six people per square mile. (Only Alaska has a lower population density. However, since I do not have weighted data for Alaska, I use Wyoming for this illustration.) Wyoming is the 10th largest state by area, has several mountain ranges, and an estimated population of 577,737 as of 2018. See https://en.wikipedia.org/wiki/Wyoming. Retrieved June 14, 2019.

Table 5. Wyoming Electricity Service Providers and Population Density by County

(in ascending order of population density.)

County	Population Density (pop/sq. km) in 2017	Electricity Service Providers
Niobrara County	0.9	Niobrara Electric Association (Coop), Wyoming Municipal Power (Town of Lusk) (Muni)
Carbon County	2	Carbon Power and Light (Coop), High Plains Power (Coop), Pacific Corp/Rocky Mountain Power (IO)
Johnson County	2.1	Big Horn Rural Electric (Coop), High Plains Power (Coop), Montana Dakota Utilities (IO), Powder River Energy (Coop), Pacific Corp/Rocky Mountain Power (IO)
Sublette County	2.1	Bridger Valley Electric Association (Coop), Lower Valley Energy (Coop), Pacific Corp/Rocky Mountain Power (IO)
Hot Springs County	2.4	High Plains Power (Coop), Pacific Corp/Rocky Mountain Power (IO)
Crook County	2.5	Montana Dakota Utilities (IO), Powder River Energy (Coop)
Weston County	3	Niobrara Electric Association (Coop), Powder River Energy (Coop)
Converse County	3.3	Niobrara Electric Association (Coop), Northern Lights Energy Company (Coop), Pacific Corp/Rocky Mountain Power (IO)
Big Horn County	3.7	Big Horn Rural Electric (Coop), Garland Light and Power (Coop), High Plains Power (Coop), Montana Dakota Utilities (IO), Pacific Corp/Rocky Mountain Power (IO), Powder River Energy (Coop), Wyoming Municipal Power (City of Deaver) (Muni), Town of Basin (Muni)
Washakie County	3.8	Big Horn Rural Electric (Coop), High Plains Power (Coop), Pacific Corp/Rocky Mountain Power (IO)
Park County	4.1	Big Horn Rural Electric (Coop), City of Cody (Muni), Garland Light and Power (Coop), High Plains Power (Coop), Montana Dakota Utilities (IO), Pacific Corp/Rocky Mountain Power (IO), Wyoming Municipal Power (City of Powell) (Muni)
Platte County	4.2	Niobrara Electric Association (Coop), Wheatland Rural Electric Association (Coop), Wyoming Municipal Power (Town of Guernsey, Town of Wheatland) (Muni)
Sweetwater County	4.2	Bridger Valley Electric Association (Coop), Pacific Corp/Rocky Mountain Power (IO)
Fremont County	4.4	High Plains Power (Coop), Pacific Corp/Rocky Mountain Power (IO)
Lincoln County	4.4	Lower Valley Energy (Coop), High West Energy Cooperative (Coop), Pacific Corp/Rocky Mountain Power (IO)
Teton County	5.3	Lower Valley Energy (Coop)
Goshen County	6	Niobrara Electric Association (Coop), Wyoming Municipal Power (City of Torrington, Town of Fort Larmie, Town of Lingle) (Muni), Wyrulec Company (Coop)
Albany County	8.5	Black Hills Energy (IO), Carbon Power and Light (Coop), High West Energy Cooperative (Coop), Pacific Corp/Rocky Mountain Power (IO), Wheatland Rural Electric Association (Coop)
Campbell County	9.6	City of Gillette (Muni), Powder River Energy (Coop), Pacific Corp/Rocky Mountain Power
Uinta County	10.1	Bridger Valley Electric Association (Coop), Pacific Corp/Rocky Mountain Power
Sheridan County	11.5	Big Horn Rural Electric (Coop), Montana Dakota Utilities, Powder River Energy (Coop)
Natrona County	14.1	High Plains Power (Coop), Pacific Corp/Rocky Mountain Power
Laramie County	34.2	Black Hills Energy, High West Energy Cooperative (Coop), Pacific Corp/Rocky Mountain Power, Wheatland Rural Electric Association (Coop), Wyoming Municipal Power (Town of Pine Bluffs) (Muni)

Figure 2. Wyoming Population Density and Electricity Service by Ownership Type



higher than the average IO pole attachment rate in Wyoming. The standard deviation for Munis is only 8% greater than that for IOs. However, the standard deviation for Coops in Wyoming is 776% greater than that for IOs.[32]

Wyoming illustrates what has been documented in other states such as North Carolina. That is, even in cases without variation in the geographic setting faced by poles owned by regulated and unregulated utilities, we observe significantly higher attachment rates charged by unregulated owners. There are also documented cases of extreme increases in the attachment rate for the same exact pole after the sale of the pole from an IO Utility to an electric Coop. [33] In both situations -- both cases with no variation in the geographic setting -- these higher rates can only be explained by the abuse of monopoly power.

When unregulated, Coops and Munis can charge more for pole attachments simply to increase revenue. Moreover, in situations where Coop or Muni utilities provide or intend to provide broadband services, the lack of regulation makes it possible for Coops and Munis to use pole attachment rates as an anti-competitive measure against other broadband service providers.[34]

---

[32] *See* Table A4 in the Appendix. There are two counties in Wyoming that are only served by Coops, Weston and Teton. Weston has a fairly low population density (but is only 7th in rank by lowest population density) and is not in an area of pronounced elevation. Teton is above the mean population density by county in Wyoming and is the location of the Grand Teton Mt. However, elevations in its surrounding counties appear to have similarly high elevations (although perhaps not covering as much of the county) as Teton.

[33] Two examples of this type of abuse occurred in Virginia when two regulated private utilities (Allegheny Power and Delmarva) sold their poles to unregulated rural electric Coops (Rappahannock Electric Coop, Southern Virginia Electric Coop and A&N Electric Coop). Pole attachment rates increased from around $4 to over $18.50 in one case and close to $30 in another. The poles had not changed since they were sold to the Coops. The only change was in ownership from a regulated entity to an unregulated one. See Report on Electric Cooperative Pole Attachment Issues, Commonwealth of Virginia, State Corporation Commission, Report to the House Commerce and Labor Committee and the Senate Commerce and Labor Committee of the Virginia General Assembly, Nov. 1, 2011 (proceeding before the Virginia State Corporation Commission (SCC) undertaken at the request of the Virginia legislature which resulted in an amendment to the Virginia statute governing electric cooperatives giving the SCC express jurisdiction to adjudicate pole attachment rate disputes).

[34] Municipalities and power Coops have repeatedly been found imposing contractual and installation conditions as a way of increasing the cost or expense for broadband providers, either to gain negotiating leverage or to make

Regardless of motivation, higher than competitively justifiable pole attachment rates will, all else equal, negatively impact overall broadband deployment and quality, while also leading to higher prices to consumers. This is particularly exacerbated in rural areas where more poles are needed to reach the average consumer.

V. Impact of Section 224 Exempt Pole Attachment Rates

A. Broadband Investment and Deployment

The FCC has recognized the impact of excessive pole attachment rates on broadband investment and deployment, explaining that "increased pole attachment rates would ultimately be recovered from consumers, and could lead some consumers to cut back or even discontinue their service;" and that "lower pole rental rates serve to encourage broadband investment."[35] The FCC

competition more difficult. For example, *The News&Observer* reported in 2016 that Time Warner had filed complaints with the N.C. Utilities Commission against several rural co-ops in NC over disputes over pole lease contracts and the co-ops' use "… of stonewalling, coercion, retaliation and other strong-arm tactics. The company says the co-ops have threatened to cut off Time Warner's electric service, threatened to impose penalties in the millions of dollars, and even threatened to call the local sheriff on a Time Warner technician performing repair work during a service outage." *See* https://www newsobserver.com/news/business/article82130342 html and State of North Carolina Utilities Commission Raleigh, Docket No. EC-52, Sub 39.

Similarly, in 2016, Fox 17 News in Nashville reported, "Duck River Energy Cooperative says up to 7K Comcast customers in Franklin and Moore counties could lose TV or internet if Comcast doesn't pay bill." The article quotes Comcast statement, "To avoid an interruption of service, Comcast has once again agreed to pay Duck River significantly more than what is owed under our current contract, despite Duck River's refusal to negotiate reasonable terms. Since 2012, Comcast has attempted to negotiate in good faith a new pole agreement with Duck River. Unfortunately, the utility has been unwilling to compromise and has billed Comcast for arbitrary pole rates that are nearly three times the national average. We believe that Duck River's attempt to more than double pole access fees, and their rejection of our proposal to invest $500,000 into the community for broadband expansion, is an obvious abuse of power and jeopardizes broadband development in Franklin and Moore Counties." *See* https://fox17.com/news/local/energy-co-op-calls-out-comcast-for-not-paying-bill-mid-state-customers-could-be-affected. On June 17, 2019 Duck River again announced that it may be "… forced to disconnect power supplies and remove equipment for non-payment of pole attachment rental fees," unless Comcast pays prior to June 24. *See* http://www.dremc.com/cable-tv-internet-in-franklin-and-moore-counties-could-be-affected-by-comcasts-pole-rental-delinquency/

[35] Implementation of 224 of the Act; A National Broadband Plan for Our Future, 30 FCC Rcd. 13731, 13739-40, 13748-49 (2015), aff'd, Ameren Corp. v. FCC, 865 F.3d 1009 (8th Cir. 2017).

further recognized that artificially high rates create marketplace distortions which skew deployment to areas with more favorable pole attachment regimes.[36]

The National Rural Electric Cooperative Association (NRECA) recently released a white paper intended to support the position that electric Cooperatives should remain exempt from FCC and certified state regulation pursuant to Section 224. NRECA argues that "Pole attachment rental rates are a fraction of the overall cost to build broadband systems in rural areas," and that the "major impediments to rural broadband deployment are low population densities, high capital costs and other major operating expenses in rural areas."[37] It is true that excessive pole attachment rental rates in rural areas by Coops and Munis are not the only factor reducing rural broadband deployment. However, it is not true that they have "little, if any, influence on decisions by cable companies and other for-profit communications companies to invest in advanced broadband infrastructure in rural America."[38]

Fundamentally, all investment decisions are based on expected profits. Any factor which lowers expected profits will lower investment, all else equal. In the case of building out new infrastructure or investing in improving existing infrastructure, the issue for the broadband provider is identifying which geographic areas have the highest present value of expected profits. Hence, any factor which negatively impacts expected profits in one geographic area will, at the margin, lead to an increased likelihood that investments will instead be made elsewhere.

[36] Ibid.
[37] NRECA. "Rural Electric Cooperatives: Pole Attachment Policies and Issues: Broadband Deployment in Rural America Not Impeded by Pole Attachment Rates." (June, 2019) at 1.
[38] Ibid.

Consider the example of two rural areas in a state without Coop rate regulation, both currently lacking broadband service. The two areas are identical (in population, average income, average population density, topography, costs of deployment, etc.) but for the fact that one receives electrical service from a Coop and the other from an IO. A broadband provider is deciding which area to deploy in first. All else equal, it will choose the area with a lower expected present value of pole attachment costs. This means not only that it will tend to favor the area with currently lower attachment costs, but even more importantly, that it will choose the area with less risks of future increases in attachment costs. Based on the current Section 224 exemption, even if the Coop and the IO are currently charging the exact same pole rental rate, the broadband provider will choose to deploy in the area served by the IO utility first since it knows that future pole rates in that area will only adjust based on actual changes in costs. In the area served by the Coop, the Coop may simply choose to increase its pole attachment rates significantly in the future in order to counter other revenue shortfalls or because it wishes to begin offering its own broadband service. These types of arbitrary and extreme price increases can and have happened.

Arbitrary and extreme price increases are possible because the unregulated utility has monopoly power over these utility poles, because the broadband provider will have very little negotiating power *after* it has already deployed in the area, and because current federal regulations simply allow the Coop (Muni) to charge whatever it wants unless that state has its own rate regulations.[39]

Importantly, it is not just the fact that Coops and Munis are charging higher pole attachment rates but also the fact that there is *little preventing future large and arbitrary increases* in these

[39] In this manner, Section 224 exemption for Coops and Munis also exacerbates the risks of overbuilding by pole owners and wasting federal grants intended to spur new broadband deployment, rather than overbuilding.

rates that will most dissuade a broadband provider from investing in a rural area where it will be captive to a Coop or Muni. In other words, the broadband provider has the most control (negotiating power on pole attachment rates) at the time when it is deciding *where* to deploy. The broadband provider will choose an area with the highest expected return. Uncertainty over future costs of operation (especially when these costs cannot be avoided) have an important negative impact on these expected returns.

Interestingly, the NRECA paper admits that Coops generally are charging more that IO utilities for pole attachments. But it then claims that pole attachment rates are not a barrier to broadband deployment. NRECA makes three related arguments to support this claim. I address each in turn.

1. NRECA claims that pole attachment costs "… are a fraction of the overall cost to build broadband systems in rural areas," and hence have little to no impact on rural broadband deployment decisions.[40] The fallacy of this statement has already been discussed above. Moreover, the NRECA paper continuously focuses on fixed costs of deployment while ignoring the impact of expected annual operational costs on the present value of all future profits. It argues that the annual cost of pole attachments is minimal relative to the cost of deploying a fiber network. Total fixed deployment costs matter, but only as part of the calculation of the net present value of all future expected profits from this deployment. Crucially, expected future profits are negatively impacted by higher pole attachment rates. In fact, CenturyLink (both an entity that needs attachments from third-parties and a pole owner) emphasizes that the negative consequences of artificially high pole attachment rates are magnified in rural settings since

[40] NRECA, at 1.

"providing service to rural customers requires more poles per home passed than in urban and suburban areas. CenturyLink maintain[s] that pole attachment fees, therefore, can be one of the largest costs in reaching rural customers and the key component in determining where and how far advanced services can be deployed." [41]

2. NRECA states that if pole rates were a true barrier, broadband would be more readily available in rural areas served by IO utilities "…since they are subject to FCC-regulated pole attachment rates that are generally lower than most electric Cooperative rates. This is generally not the case."[42] Yet NRECA presents no econometric research examining the *marginal impact* of higher pole attachment rates (or even the simple presence of Coops or Munis) on actual broadband deployment.

The NRECA paper claims that its own research comparing broadband service in rural areas in Alabama, Vermont, and Virginia show that "… broadband is not significantly more readily available in rural IOU service areas despite FCC-regulated pole attachment rates that are lower than most Cooperative rates."[43] This is an odd statement given that its own table shows that only 40% of the rural households served by IO utilities are underserved compared to 57% when served by Coops located in the rural communities of the three states that NRECA chose to analyze.

However, NRECA argues that there is a correlation between population density and broadband penetration, and thus, the lower levels of rural deployment in Coop service areas are

[41] CenturyLink Amicus Brief, NC Utilities Commission, 2017, at 13.
[42] Ibid.
[43] Ibid, at 11.

due to lower levels of population density in the rural Coop service areas relative to the rural IO service areas in their sample, and not due to higher pole attachment rates.[44]

I do not doubt that a correlation between population density and broadband penetration holds. However, NRECA does not say that population density explains 100% of the observed differences in broadband penetration, nor does its analysis appear to control for any other factors that impact broadband deployment. As such, NRECA's statement -- that there is not significantly more broadband penetration in rural areas served by IOs -- is not supported by the data it presents. Moreover, the secondary conclusion that NRECA then makes -- that pole attachment rates are not influencing deployment -- does not follow just because there exists a positive correlation between population density and deployment. It is likely that in an appropriately designed regression, the NRECA data would actually show that the presence of unregulated Coops or Munis (especially if they are already charging excessive pole attachment rates) does indeed have a negative impact *at the margin* on deployment in these rural areas, even after controlling for other factors such as population density.[45]

3. NRECA describes four cases where electric Cooperatives offered "… discounted or free pole attachments to communications companies in exchange for expanded rural service."[46]

---

[44] NRECA shows that the average density per square mile in these rural areas is 37.4 for IOs versus 22.1 for Coops.
[45] One case that NRECA puts forward as an example of the small impact of higher pole attachment rates is a case in Virginia where a Coop was charging $20.60 per pole. Based on an assumption of approximately 30 poles per mile, NRECA estimates that this rate would cost a broadband provider about $564 per mile per year. (NRECA, at 7). I note that 30 times $20.60 equates to a cost of $618 per mile per year. NRECA states that its Coops serve an average of eight consumers per mile of electric line, and that this number is significantly lower for Coops that are not near cities. Consider this case of eight electric consumers per mile number. Even if 100 percent of these electric consumers took up broadband service (which is unlikely to be the case), this pole attachment cost would imply a cost of $77.25 per broadband customer per year. Compared to the average IO pole attachment cost of $6.84, this would imply an *extra cost of $51.60 per broadband customer per year*, relative to the average IO service area. If only six of the eight electric customers decide to sign up for broadband service, then this would imply an *extra cost of $68.80 per broadband customer per year*. These are clearly not negligible costs from the perspective of a broadband service provider when deciding *where* to deploy.
[46] NRECA, at 14.

NRECA suggests that since no communications companies agreed to the terms proposed in these instances, this demonstrates that pole attachment rates are not driving broadband deployment decisions. There are several problems with this conclusion. Firstly, looking at the three offers described by NRECA, there were specific conditions associated with these offers, such as requirements to build out to 100% of Coop customers within 5 years, or offering 50% discounts on current Coop rates (when these were likely already more than twice that of IO rates), or not guaranteeing what rates would be charged after the first five years, etc.[47] Simply because a Coop is offering "discounted" attachment rates does not mean that the conditions in these proposals are reasonable or provide enough of an increase in expected future profits to change a broadband provider's interest in providing service in that Coop's service area.[48]

NRECA further suggests that Coops are themselves best suited to undertake rural deployment.[49] It is worth noting that a Coop (Muni)'s expected profits from broadband deployment will be greater if another broadband provider has not already entered the Coop's service area. Or if a broadband provider has already incurred the fixed costs of deployment in the Coop's service area, the Coop could at that point start raising attachment rates in order to skew competition for broadband service provision in its favor.

---

[47] One of the four instances described by NRECA is actually about proposals for a state bill in Arkansas and not about any concrete offer made by any Coops there.

[48] For example, the Tennessee Electric Cooperative Association stated that no broadband provider ever took advantage of the 2008 offer to provide a 50% discount on 2008 rates (continued until 2018) for broadband deployment in "historically unserved areas." I do not know what the average Coop pole attachment rate was in 2008. However, the NCTA data show that in 2017 the average Coop rate ($17.76) was more than three times that of the average IO rate ($5.51) in Tennessee. Hence, even a 50% discount would still leave the Coop rate significantly greater than IO rates.
See Memorandum to the Tennessee Advisory Commission on Intergovernmental Relations ("TACIR") submitted by the Tennessee Electric Cooperative Association, October 21, 2015, regarding TACIR's study on the Development and Deployment of Broadband in Tennessee, at 25, available at https://www.tn.gov/content/dam/tn/tacir/commission-meetings/2015-october/2015OctoberTab3BB_TECA.pdf.

[49] See NRECA, at 1.

Broadband providers could undertake efforts with state regulators to fight what they consider excessive pole attachment rates by unregulated pole owners. However, the large number of Coops and Munis, who are often in already less attractive markets, make the overall transactions costs of fighting each incidence of such behavior quite high. Conversely, if the exemption were removed, there would be a consistent cost-based standard throughout the U.S. since the FCC and most of the certified states use the same formula for setting pole attachment rates.

Coops and Munis often justify their high attachment rates on the premise that for-profit companies have enough profits to cover higher attachment rates, while they are non-profits, and higher attachment rates allow them to cover more of their own costs and in turn offer lower rates to their electrical clients. For example, NRECA states, "Artificially low pole attachment rental rates, set below cost, are more likely to increase communications company profits while having the unfortunate effect of adversely impacting electricity rates because the Cooperative would be required to pay a greater share of the system's pole ownership and maintenance costs."[50] There are three fundamental fallacies in this statement.

First, the FCC formula is based on actual costs and hence removal of Section 224 exemption for Coops and Munis would not force them to charge "artificially low" rates, but rather would force them to charge rates based on their actual pole costs *allocated to attachments*, rather than based on the Coop or Muni's desire to pass on costs related to their own provision of electric (or competing broadband) service on to attaching communications companies.

[50] NRECA (2019), at 2.

Second, it is widely recognized by regulators that non-profits, especially when granted monopoly rights through regulation, should not be setting prices to extract profits from for-profit firms simply to subsidize their own activities.[51]

Third, the NRECA statement suggests that there would be a net social gain from being subsidized by communication companies because this would allow for lower electricity costs in their service areas. Even if one ignores welfare costs that such subsidization would create outside the Coop's service area, this statement is still unlikely to be true. The discouraging of broadband investment – whether in new deployment or improvements in an existing network in that service area – would harm the very same residents that the NRECA is claiming would unambiguously gain from having reduced electrical rates. The net welfare impact on consumers within the Coop's service area would depend on the marginal gain from this potential reduction in electrical costs versus the marginal loss from either the absence of, or the reduced quality and/or higher cost of, broadband service.[52]

B. Overall Social Welfare

Within an unregulated market there is no economic distinction between for-profit and non-profit firms in terms of costs or prices. In the case of regulated markets, it is important for social welfare that the regulated market comes as close as possible to outcomes that would be present in an unregulated market since – absent market failure - an unregulated market will maximize

[51] *See* State of NC Utilities Commission Doc No. EC-39, at 45.
[52] The fact that an attaching broadband provider pays 100% of the cost of adding new poles when they are specifically needed for broadband deployment means that any marginal increases in the size of Coop's footprint driven by broadband deployment in rural areas already implies subsidization of the utility by the broadband provider, which can then make use of that pole without having spent anything on its installation.

social welfare. It is economically inefficient and socially suboptimal to allow the supra competitive rates charged by Coops and Munis simply because they are non-profit entities.

There are public interest benefits in having similar regulations for similar poles, regardless of whether owned by a non-profit or not.[53] Similar regulations for similar poles are important so as not to favor one type of pole owner over another and to not favor one type of industry or competitor over another (e.g. favoring utilities over cable/broadband ISPs) since in a market setting pole attachment rates would not differ simply based on the type of pole owner.

Similar regulations for similar poles also create greater certainty for firms that must attach to poles in order to provide their services. Uncertainty over what Coop and Muni pole owners charge for new pole attachments, or how they may arbitrarily increase their rates for current attachments, leads to diminished overall investment by firms who must rely on pole attachments both for further deployment and for improved quality.

V. CONCLUSION

With a new comprehensive data set from NCTA on over 52 million pole attachments in 48 states and the District of Columbia, the most complete set of information on pole attachment rates collected to date, we see a pervasive pattern: 1. Coops and Munis charge excessive rates on average – over twice that of IO pole attachment rates. 2. The rates charged by Coops and Munis vary by far more than those charged by IO poles even though IO poles are present over an even wider range of locations (geographic or otherwise). 3. State regulations imposed to counter

[53] State of NC Utilities Commission Doc No. EC-39, SUB 44, at 22 referencing Kravtin.

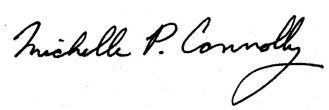
Section 224 exemption have not on average been able to eliminate over pricing by Coop and Muni pole owners.

After controlling for state fixed effects, Coops and Munis are still on average found to charge more than twice the attachment rate of IO poles. Even in the presence of state Coop and Muni attachment rate regulations, Munis and Coops are still on average charging 130% to 145% that of IO utilities rates in the same state. This demonstrates that existing state regulations and enforcement have not consistently prevented Munis and Coops from charging excessive rates and that national removal of the Section 224 exemption for Munis and Coops is needed.

These higher per pole attachment costs due to Section 224 Muni and Coop exemptions diminish incentives for cable operators to invest in existing networks and to expand their coverage areas. This has a multiplicative effect in rural areas (where Muni and Coop poles are frequently located) because households are located farther apart, and the number of poles required to provide service to each household is greater. Broadband providers already experience higher non-pole related costs of reaching rural households. Any excess pricing *per pole attachment* therefore multiplicatively increases the cost of reaching a rural household relative to an urban household. Hence, the Section 224 exemption for Coop and Muni poles has contributed to the existing digital divide between urban and rural communities in the U.S., and will continue to do so until this exemption is eliminated.

Removal of the exemption of Coop and Muni owned poles from FCC jurisdiction in Section 224 is key to accelerating investment in broadband networks, particularly in rural areas, thereby helping to decrease the digital divide in the U.S. Without its removal, there will be

continued artificial disincentives to deploy in areas served by Coops and Munis that are charging supra competitive pole attachment rates.



Michelle P. Connolly

APPENDIX

A1. Cleaning and Representativeness of NCTA Data

Cleaning

I was given the raw data files from each cable operator. I checked the data for internal consistency and possible duplicate entries. When entries were flagged as being potential duplicates, the NCTA asked the cable operators for clarification. In situations where no clarification was received, I made the conservative assumption that entries identified as potential duplicates were indeed duplicates and removed them from the analysis. The exclusion of these potential duplicates impacts estimates for a few states but does not dramatically affect estimated national average pole rates by ownership type.

I further checked certain extreme values and to the extent possible confirmed reported rates based on similar reported rates for the same pole owner coming from more than one cable operator.

Representativeness

I checked to see whether the lack of observations in the data set for particular types of owners in particular states is an accurate reflection of actual utility types within states, or rather indicates a limitation of the data set. For example, the data set includes no rate observations from Coop owned poles in CT, MA, and DC. However, this accurately reflects the fact that none of the three have Coops. Similarly, WV and DC have no Munis, and NE has no Investor-Owned utilities. MD and NV have only one Muni operating in each, but the cable operators in this data set do not attach to any of those Muni owned poles so we have no Muni observations for those two states. We also confirmed that neither Charter nor Comcast are attached to poles owned by the eight

Coops in UT, the two Munis in AZ, the three Munis in ID, or the one Muni in NV. Hence, it is appropriate that we do not have observations in those categories for those states.

As mentioned previously, weighted data from five of the top ten U.S. cable operators are used in my analysis. Table A1 shows both the number of subscribers and households passed by the top ten cable operators in 2017. The operators in bold are those included in the analysis of this report.

Table A1. Top U.S. Cable Operators by Households Passed 2017

Rank	Cable Operators	Subscribers	Households Passed
1	**Comcast**[54]	22,357,000	**57,225,000**
2	**Charter**	16,850,000	**50,066,000**
3	Cox	3,852,481	10,821,141
4	**Altice**[55]	3,581,740	**8,621,000**
5	WOW!	432,600	3,109,200
6	**Mediacom**[56]	821,000	**2,854,724**
7	TPG (Wave, RCN, Grande)	467,283	2,570,901
8	Cable One[57]	363,888	2,145,577
9	**Midco**	211,755	**805,095**
10	Atlantic Broadband	233,174	594,832

Source unless otherwise noted: Kagan. S&P Global Insight, SNL Kagan, Top Cable MSOs, Q4 2017 estimate.
Cable Operators in bold provided the weighted data included in analysis.

I further want to be confident that the NCTA data offers a good representation of the total distribution of pole owners in the U.S. Table A2 shows that approximately 12.3 percent of the data set's pole observations are owned by Coops and Munis. Ideally, one could directly compare the NCTA data set to a national data set on total poles, their attachments, and ownership.

[54] *See* https://www.cmcsa.com/static-files/4bdc3842-684d-49e6-930f-1e174226ff72
[55] Altice USA Reports Full Year and Fourth Quarter 2017 Results, February 27, 2018. http://s22.q4cdn.com/118672413/files/doc_news/2018/ATUS-Q4-17-Results-Press-Release-vFinal.pdf
[56] Mediacom Communications Reports Combined Results for Fourth Quarter and Full Year 2017. https://mediacomcommunicationscorporation.gcs-web.com/news-releases/news-release-details/mediacom-communications-reports-combined-results-fourth-0
[57] Cable One Reports Fourth Quarter and Full Year 2017 Results. http://ir.cableone net/file/Index?KeyFile =392397945

Unfortunately, there is no such national data set listing total poles and their owners (other than what is offered in this new NCTA data set). All poles are not equally likely to have cable attachments. And, for a given number of end consumers, there are will be more poles per consumer in more rural areas where population is less dense.

Table A2. Distribution of Data by Pole Owner Type

Pole Owner Type	% of Poles in NCTA Data	% of Electricity Consumers Served in U.S.
Investor Owned	87.7%	68%
Coop	6.3%	13%
Muni	6%	15%
Total	100%	96%*

Sources: NCTA; for percent of electricity consumers served, American Public Power Association Stats and Facts, https://www.publicpower.org/public-power/stats-and-facts, retrieved 11/26/2018.
* Four percent of electricity consumers are served by Power Marketers.

Hence, data limitations make it impossible to perfectly predict, from a separate data source, the total number and distribution of poles by owner type with cable attachments that one should expect to find in the NCTA data set. As the next best option, I consider the distribution of U.S. electricity consumers served by utility types. There is no reason why this distribution should be identical to the distribution of pole owners with cable attachments. Still, having a reasonably similar distribution of ownership types provides additional confidence the NCTA data are not significantly over- or underrepresenting pole owner types. The last two columns of Table A2 show that although IO poles are a larger percentage of poles relative to the percent of electricity consumers served by IO utilities, the percentage of poles in the NCTA data set by owner type is nonetheless broadly consistent with the percentage of U.S. electricity consumers served by utility type.

The higher percentage of IO poles in the data set relative to percentage of electric consumers served by IO utilities could be due to three possible factors: 1. If particular utility providers are covering less densely populated areas, they will have more poles relative to consumers. The fact that the NCTA pole attachment data has a larger percentage of IO poles likely reflects the fact that although Coops and Munis are on average located in more rural areas, there still appear to be more IO utility facilities *in total* than Coops and Munis facilities providing electricity to less densely populated areas.[58] 2. The NCTA data set comes from larger cable operators. If these larger cable operators are in areas less frequently served by Coops or Munis than the national average, then the data set might have an oversampling of IO poles relative to the national average. Still, this would reflect an accurate owner distribution for the areas served by these five cable operators. 3. Four percent of U.S. electricity consumers are served by Power Marketers. Without knowing the distribution of utilities owners Power Marketers rely upon, it is not possible to appropriately determine whether these would be more likely to suggest more IO poles in the national distribution.

[58] The NCTA data include the pole location by state. If one uses the average population density of the state, we see that Munis and Coops are on average present in states with lower population densities than Investor Owned utilities. However, there are still more IO poles *in total* present in these lower population density states. This is an admittedly imprecise observation since there can be large differences in population density within different areas of a state. However, it is known that the distribution of IO utility poles covers both dense and less densely populated areas. The NCTA data set confirms that IO utility poles are observed in all ranges of population density – at least measured at the state level. My inspection of Wyoming, the second least densely populated state in the U.S. also confirms that IOs are present in very low density areas. Specifically, IOs are present in five of the six least population dense counties in Wyoming and in 18 of 23 counties, IOs are present in the exact same counties as Munis and/or Coops.

Table A3. Presence of State Regulation of Pole Attachments in 2017

State	Cooperatives	Municipalities
Alabama		
Alaska	Yes	Yes
Arizona		
Arkansas	Yes	
California		Yes
Colorado		Yes
Connecticut		
Delaware	Yes	
D.C.		
Florida		
Georgia		
Hawaii		
Idaho		Yes
Illinois		
Indiana	Yes	Yes
Iowa		
Kansas		
Kentucky	Yes	
Louisiana	Yes	Yes
Maine		
Maryland		
Massachusetts		Yes
Michigan	Yes	
Minnesota		
Mississippi		
Missouri		Yes
Montana		
Nebraska		
Nevada		
New Hampshire	Yes	
New Jersey		
New Mexico		
New York		Yes
North Carolina	Yes	Yes
North Dakota		
Ohio		
Oklahoma		
Oregon	Yes	Yes
Pennsylvania		
Rhode Island		
South Carolina		
South Dakota		
Tennessee		
Texas	Yes	Yes
Utah	Yes	
Vermont	Yes	Yes
Virginia	Yes	
Washington	Yes	Yes
West Virginia		
Wisconsin		Yes
Wyoming		

Source: NCTA provided this information.

Table A4. Summary Statistics by State and Pole Ownership

State		Observations	Mean	Std. Dev.	Min	Max
AL	All Poles	1,722,783	9.69	5.67	0.36	30.46
	Investor Owned	1,342,498	7.03	2.42	0.36	18.00
	Coop	185,119	19.37	3.28	5.00	29.06
	Muni	195,166	18.80	3.59	7.41	30.46
AR	All Poles	400,511	5.26	4.40	0.58	20.00
	Investor Owned	328,966	3.55	0.99	0.58	10.37
	Coop	44,665	16.65	3.50	3.00	20.00
	Muni	26,880	7.25	1.25	6.90	12.50
AZ	All Poles	126,685	10.44	4.95	0.54	21.64
	Investor Owned	111,168	9.77	4.31	0.54	18.24
	Coop	15,517	15.25	6.39	8.34	21.64
	Muni	0				
CA	All Poles	4,275,469	7.10	4.55	0.28	74.46
	Investor Owned	4,147,578	6.73	3.48	0.28	28.96
	Coop	8,391	49.70	29.16	15.08	74.46
	Muni	119,500	16.79	5.81	2.52	30.58
CO	All Poles	530,809	5.98	2.78	2.74	22.79
	Investor Owned	459,932	5.26	1.15	2.74	6.99
	Coop	33,958	12.87	6.20	3.31	22.79
	Muni	36,919	8.65	1.57	5.25	13.94
CT	All Poles	987,407	9.44	2.99	5.49	14.32
	Investor Owned	982,470	9.43	2.99	5.49	14.32
	Coop – N/A	0				
	Muni	4,937	10.01	2.75	6.29	12.50
DC	All Poles	75,834	7.46	2.19	3.10	8.56
	Investor Owned	75,834	7.46	2.19	3.10	8.56
	Coop – N/A	0				
	Muni – N/A	0				
DE	All Poles	192,440	8.17	4.52	2.68	17.55
	Investor Owned	158,588	6.36	2.14	2.68	7.90
	Coop	30,586	17.55	0.00	17.55	17.55
	Muni	3,266	8.17	0.00	8.17	8.17
FL	All Poles	3,930,822	9.96	6.82	1.71	34.82
	Investor Owned	3,299,782	8.32	4.98	2.89	14.88
	Coop	325,515	20.64	8.84	6.50	34.82
	Muni	305,525	16.35	7.48	1.71	31.69
GA	All Poles	2,058,598	9.87	6.09	0.72	65.24
	Investor Owned	1,432,248	6.00	1.55	0.72	33.00
	Coop	512,372	19.12	0.88	18.46	27.55
	Muni	113,978	16.82	3.81	3.60	65.24
HI	All Poles	4,162,866	1.11	0.74	1.08	22.17
	Investor Owned	4,158,280	1.10	0.71	1.08	22.17
	Coop	644	5.76	0.00	5.76	5.76
	Muni	3,942	8.60	0.00	8.60	8.60
IA	All Poles	571,146	3.81	2.56	0.19	30.03
	Investor Owned	533,386	3.41	1.83	0.19	30.03
	Coop	4,980	8.21	4.94	5.00	25.00

	Muni	32,780	9.63	4.04	2.00	16.79
ID	All Poles	48,669	13.88	2.21	1.57	25.44
	Investor Owned	44,294	13.60	1.97	1.57	25.44
	Coop	4,375	16.73	2.51	5.15	20.65
	Muni	0				
IL	All Poles	1,711,539	10.46	5.21	0.28	31.50
	Investor Owned	1,663,570	10.42	5.16	0.28	30.03
	Coop	12,888	13.27	7.77	4.50	24.29
	Muni	35,081	11.28	6.28	3.00	31.50
IN	All Poles	1,309,551	6.71	3.31	1.50	35.35
	Investor Owned	1,179,300	6.05	2.39	1.50	20.75
	Coop	67,227	14.49	4.46	5.21	35.35
	Muni	63,024	10.71	3.27	4.00	19.56
KS	All Poles	72,065	12.82	7.73	0.54	23.12
	Investor Owned	38,122	7.02	2.83	0.54	8.42
	Coop	3,653	10.35	1.43	9.97	17.95
	Muni	30,290	20.41	5.57	2.00	23.12
KY	All Poles	986,785	8.15	5.42	0.16	30.46
	Investor Owned	712,422	7.14	1.79	0.67	30.03
	Coop	227,759	8.65	8.16	0.16	30.45
	Muni	46,604	21.13	7.85	4.38	30.46
LA	All Poles	1,206,548	7.44	3.09	0.75	20.43
	Investor Owned	1,106,366	6.93	2.32	2.72	10.10
	Coop	75,284	14.04	3.79	0.75	16.70
	Muni	24,898	9.95	5.54	2.00	20.43
MA	All Poles	2,313,960	8.63	3.24	2.49	20.95
	Investor Owned	2,233,664	8.66	3.18	3.69	20.61
	Coop – N/A	0				
	Muni	80,296	7.71	4.66	2.49	20.95
MD	All Poles	915,790	6.97	2.99	3.29	10.12
	Investor Owned	891,876	6.97	3.02	3.29	10.12
	Coop	23,914	6.70	1.51	5.00	10.00
	Muni (only one in state)	0				
ME	All Poles	1,153,164	10.52	1.83	4.20	18.14
	Investor Owned	1,145,204	10.54	1.82	4.20	18.14
	Coop	5,862	8.62	0.24	8.50	9.12
	Muni	2,098	5.42	1.74	4.94	11.76
MI	All Poles	2,922,500	3.72	1.13	0.42	19.00
	Investor Owned	2,796,188	3.59	0.58	1.43	9.26
	Coop	30,711	3.81	0.27	3.74	4.95
	Muni	95,601	7.54	3.77	0.42	19.00
MN	All Poles	672,585	6.54	4.15	0.98	94.50
	Investor Owned	588,202	6.02	3.25	1.34	18.35
	Coop	20,007	13.89	4.67	2.00	94.50
	Muni	64,376	9.06	7.11	0.98	20.24
MO	All Poles	1,172,704	9.39	3.50	0.31	38.00
	Investor Owned	980,820	9.57	2.96	0.31	25.00
	Coop	75,630	11.97	5.01	1.89	25.00
	Muni	116,254	6.13	4.22	0.72	38.00
MS	All Poles	397,183	9.31	5.80	2.77	29.11
	Investor Owned	304,018	7.20	4.06	2.77	19.56
	Coop	81,228	16.46	5.46	10.00	29.11
	Muni	11,937	14.58	2.50	11.52	17.00
MT	All Poles	112,959	9.44	2.73	2.50	19.92

	Investor Owned	95,232	8.52	1.61	3.17	15.00
	Coop	17,636	14.44	1.98	2.50	19.92
	Muni	91	6.11	0.12	6.00	6.25
NC	All Poles	1,095,813	7.98	5.25	0.30	29.19
	Investor Owned	568,628	7.07	3.48	1.31	17.28
	Coop	323,780	10.82	6.74	1.05	29.19
	Muni	203,405	6.02	4.84	0.30	22.00
ND	All Poles	82,773	4.29	1.74	0.77	14.69
	Investor Owned	58,064	4.89	1.62	0.77	7.01
	Coop	24,655	2.89	1.10	1.00	14.69
	Muni	54	4.50	0.00	4.50	4.50
NE	All Poles	76,740	9.83	4.41	1.00	16.59
	Investor Owned – N/A	0				
	Coop	2,459	8.82	1.10	1.37	8.98
	Muni	74,281	9.87	4.48	1.00	16.59
NH	All Poles	484,099	12.74	4.02	3.50	24.88
	Investor Owned	439,130	13.22	3.81	8.60	24.88
	Coop	36,694	8.72	2.64	7.40	14.00
	Muni	8,275	5.08	1.43	3.50	7.02
NJ	All Poles	1,684,335	6.39	1.57	3.72	16.59
	Investor Owned	1,680,050	6.39	1.57	3.72	16.59
	Coop	3,992	5.59	1.40	5.00	8.95
	Muni	293	10.50	0.00	10.50	10.50
NM	All Poles	322,815	7.50	3.06	2.59	20.00
	Investor Owned	294,268	6.84	1.70	2.59	8.44
	Coop	9,276	12.85	7.63	4.50	20.00
	Muni	19,271	15.02	2.67	6.75	16.00
NV	All Poles	30,098	10.46	5.64	1.55	22.32
	Investor Owned	24,996	8.05	1.97	1.55	8.71
	Coop	5,102	22.27	0.88	7.10	22.32
	Muni (only one in State)	0				
NY	All Poles	1,670,803	7.89	5.34	1.34	36.15
	Investor Owned	1,610,904	7.92	5.36	2.21	17.67
	Coop	3,929	19.53	9.01	10.00	36.15
	Muni	55,970	6.21	2.83	1.34	17.02
OH	All Poles	1,488,923	6.54	3.61	0.33	18.75
	Investor Owned	1,356,270	6.30	3.47	0.33	15.25
	Coop	59,177	11.67	3.10	2.76	18.75
	Muni	73,476	6.76	3.55	0.44	18.10
OK	All Poles	162,640	4.57	4.41	0.28	20.00
	Investor Owned	135,552	3.54	3.09	0.28	20.00
	Coop	10,498	14.40	5.10	3.00	20.00
	Muni	16,590	6.72	4.68	3.00	16.78
OR	All Poles	638,787	8.78	3.53	2.48	17.45
	Investor Owned	561,354	8.39	3.44	2.50	17.45
	Coop	47,049	11.79	1.94	5.20	16.23
	Muni	30,384	11.39	3.63	2.48	16.93
PA	All Poles	1,515,914	12.89	4.43	4.10	26.50
	Investor Owned	1,481,810	12.85	4.39	4.10	17.95
	Coop	29,953	14.19	5.01	7.00	19.20
	Muni	4,151	19.59	6.66	11.40	26.50
SC	All Poles	429,598	11.79	4.93	1.50	80.72
	Investor Owned	254,542	10.15	2.25	1.65	11.18
	Coop	126,812	15.55	5.66	2.89	80.72

	Muni	48,244	10.57	7.22	1.50	20.69
SD	All Poles	134,953	7.53	4.16	0.80	14.95
	Investor Owned	125,382	7.67	3.99	0.90	12.76
	Coop	2,546	12.32	4.70	2.75	14.95
	Muni	7,025	3.23	3.50	0.80	9.50
TN	All Poles	1,368,443	17.63	10.23	2.37	44.41
	Investor Owned	309,158	5.51	1.75	3.95	31.23
	Coop	351,647	17.76	6.12	8.72	28.00
	Muni	707,638	22.87	9.54	2.37	44.41
TX	All Poles	4,052,151	7.50	3.61	1.00	28.32
	Investor Owned	3,538,840	6.89	3.06	1.45	25.00
	Coop	273,804	12.69	3.62	1.00	21.00
	Muni	239,507	10.54	4.59	2.00	28.32
UT	All Poles	332,007	5.66	3.36	1.75	23.12
	Investor Owned	303,948	4.84	1.69	1.75	5.76
	Coop	0				
	Muni	28,059	14.50	4.17	7.00	23.12
VA	All Poles	365,623	10.12	6.43	2.87	34.46
	Investor Owned	295,946	7.40	1.69	2.87	13.00
	Coop	45,880	24.11	5.14	18.00	34.46
	Muni	23,797	16.89	5.79	8.00	27.04
VT	All Poles	102,646	7.64	1.87	1.70	12.07
	Investor Owned	84,798	7.65	1.47	5.67	10.00
	Coop	12,993	8.35	1.88	7.38	12.07
	Muni	4,855	5.53	4.56	1.70	10.97
WA	All Poles	970,108	11.36	6.73	0.83	39.36
	Investor Owned	731,850	8.79	4.12	1.10	39.36
	Coop	91,022	15.91	5.49	0.83	24.43
	Muni	147,236	21.33	7.12	6.38	30.70
WI	All Poles	546,071	6.50	2.47	0.90	37.42
	Investor Owned	528,668	6.16	0.95	0.90	12.02
	Coop	4,649	19.93	4.69	6.77	24.63
	Muni	12,754	15.68	7.87	2.00	37.42
WV	All Poles	592,815	6.82	1.83	2.00	13.75
	Investor Owned	585,308	6.82	1.82	2.00	13.75
	Coop	7,507	7.36	2.57	3.00	13.44
	Muni – N/A	0				
WY	All Poles	58,947	6.31	2.17	2.25	20.23
	Investor Owned	55,072	5.97	0.86	2.25	6.25
	Coop	2,204	13.95	6.67	5.00	20.23
	Muni	1,671	7.26	0.93	6.09	8.00

Table A5. State Fixed Effects Coefficients for Table 4

AL	-0.8416
AR	-2.7378
AZ	0.8124
CA	-6.0385
CO	-7.8895
CT	0.9348
DC	-0.9979
DE	-
GA	-1.4779
HI	-7.3534
IA	-5.2567
ID	-
IL	1.7447
IN	-5.4651
KS	-0.0101
KY	-0.6847
LA	-4.7026
MA	-4.509
MD	-1.7368
ME	1.9963
MI	-3.8114
MN	-3.0815
MO	-4.5947
MS	-1.3717
MT	-0.5124
NC	-5.9711
ND	-7.0123
NE	-7.8816
NH	5.0038
NJ	-2.0884
NM	-1.7771
NV	0.3841
NY	-5.2646
OH	-2.7525
OK	-5.4472
OR	-3.5118
PA	4.2224
SC	-0.5179
SD	-1.5877
TN	1.9422
TX	-4.8037
UT	-2.2977
VA	1.6778
VT	-4.9328
WA	-1.4039
WI	-6.6823
WV	-1.7513
WY	-2.7674

Notes: Results are relative to Florida. All coefficients are significant at the 1% confidence level, except for KS. DE and ID are omitted due to collinearity.